

THURSDAY, FEBRUARY 13, 1902.

*THE CAMBRIDGE SCHOOL, AND A ZOOLOGICAL TEXT-BOOK.*

*Zoology, an Elementary Text-Book.* By A. E. Shipley, M.A., of Cambridge, and E. W. McBride, M.A. (Camb.). D.Sc. (Lond.); of Montreal. Pp. 616; 349 text-figures. (Cambridge: University Press, 1901). Price 10s. 6d. net.

**Y**ET another elementary text-book of zoology! The accumulation of facts in zoology during the last quarter of a century has been so overwhelming, that it becomes most difficult even to gauge the capacity of a book like the present, which deals broadly with the whole field. Choice of subject-matter is so wide, selection so difficult, that, in the endeavour to form an estimate of such a work, the mere determination on the part of the reviewer of a standard of comparison upon which to judge it, is in itself an arduous task. Let it be said, however, that the senior author of the present volume has an established reputation as a text-book writer, and that his previous achievements have led us to expect a sometimes thinnish mode of treatment. While in this we are not disappointed, under the joint authorship a very creditable book has been produced.

There are twenty-three chapters in all, the first of which is an "introduction" dealing with broad principles and first definitions. The contents and style of this are such as might be expected from a well-trained first-year man, and are apt to create a false impression of the rest of the book. This simplicity of treatment, however, is intentional, and expressive of the authors' scheme—for they tell us they have aimed at producing a book which can "be readily understood by a student who had no previous knowledge of the subject," and that the phraseology of the later portions of the work is relative to the earlier. Technical terms are explained as they occur, with roots in original Greek, and with fuller definitions where necessary. "Biogen" is introduced as denoting the living molecule. Histology, embryology and palæontology are intentionally placed at a discount, the treatment of classification, and of adult structure "as the outcome of function and habit," being the guiding principle. The several sections of the work treat each of selected individuals of a phylum, and the position and interrelationships of these in the general scheme of classification are for each section concisely stated, with a short diagnosis, in an accompanying table—an arrangement favourable to lucidity in the text, of which the authors have made the most.

Following the introduction are chapters on the Protozoa, Coelenterata and Porifera. The Coelomata are ushered in with an introduction special to themselves, and the leading Invertebrate phyla—viz. the Annelida, Arthropoda, Mollusca, Echinodermata, and Chætogonatha—are in order dealt with. Seven chapters are next devoted to the Vertebrata; and there are reserved for the four which conclude the volume the Platyhelminthes, Nemertinea, Rotifera and Nematoda, regarded as phyla which cannot be definitely asserted to be Coelomata. A decidedly novel arrangement this! but, under it, the Entoprocta (barely mentioned on p.

286) appear to have escaped adequate recognition, which is the more remarkable since the Chætogonatha are accorded some three or four pages.

As a whole, the book is well written and up to date, and of the illustrations, those which are new are mostly good, those borrowed well chosen. Diagrams are given, especially where dealing with the circulatory system, and some of those of the venous channels might well be improved. There pervades the pages of the work a freshness of style and unconventionality which render them pleasant reading and attractive; while, in the frequent allusion to the commonest occurrences of daily life and human affairs, the interest of the reader is assured. The chapters on the Porifera and Annelida may be cited as thin and inadequate, there being no mention of the horny sponges, of the genus *Oscarella*, or of the branchiate *Oligochætes*. Correspondingly slender is the treatment of the "Anacanthini" and Insectivora, the paragraphs upon which are miserably poor. Of definitions, that of the Cyclostomata may be instanced as erroneous, in the non-recognition of the Bdellostomoid forms possessed of more than seven pairs of gill pouches, and the statements concerning the "bile-duct" and the branchial basket-work (by comparison with p. 347), Dohrn having shown the "extra-branchials" to be extended gill-rays.

The description of the pancreas as a mere "outgrowth from the intestine" is insufficient, by non-recognition of its compound origin, now demonstrated for all gnathostomatous groups; and, similarly, it is nowhere stated that the pulmonary artery is now known to be in all its forms a derivative of the fourth branchial arch. Nor is there mention of the highly significant transitional conditions of the heart (conus and its valves) occurring among the Clupeosces. Again, a most important point is lost in the ignoring of the circular type of the so-called semicircular canals, and the invariably saccular innervation of that which is posterior. And, finally, to pass to minor misstatements, we would remark that the forwardly directed process of the chelonian shoulder-girdle is a scapular derivative (proscapula) occurring only in these creatures and the Plesiosaurs; that the epipterygoid (columella) is not confined to the Lacertilia; that the pre-hallux of the Batrachia is not definitely proved to be a digit homologous with the rest; and that the bone which suspends the ophidian mandible is most certainly the supra-temporal.

We are also of opinion that too full an assurance is attached to the supposed quadripartite nature of the "arco-centrum." This, as a vertebral theory, was elaborated at Cambridge; and we similarly find the Balanoglossoid, also favoured of the Cambridge school, set forth with all its best traditions—but why not Cephalodiscus and Rhabdopleura as well? They are not even mentioned.

One of the most noteworthy features of this book is the tardy recognition of the facts of comparative embryology and palæontology, and it is the more remarkable that the subordination of the former in a work written by two Cambridge men, should have been decided upon, at a time when embryological discovery of far-reaching significance is being made known. In this book the treatment of even larval forms is but casual and passing,

and were the discovery (now fifty years old) of the test-bearing protochal stage of *Dentalium*, lately observed by Drew to be passed through by *Yoldia* and by Pruvot by a *Dondersia*, but recognised, we should not find the Chitons referred to a subclass of the Gastropoda and the "Solenogastres" accorded a class distinction. To this developmental stage, the discovery of which has dealt the death-blow to the idea of a Rhipidoglossan affinity of the Pelecypoda, and which, we trust, will ere long be extended to other groups, our authors should have directed attention. Had they done so, but three lines would not have sufficed for the Scaphopoda, and *Spirula* would not have been dismissed as a mere name.

Turning to palæontology, the non-recognition of the recent discovery in the Trilobites of nauplius characters deprives the authors' treatment of this larva of all force. And, similarly, had the Eurypterid forms recently described by Holm from the Russian Silurian, by Beecher from the Cambrian, and the Scorpionid genus *Palæophonus*, met with recognition, *Limulus* could not in justice have been once more relegated to the Arachnida. The absence in the present book of all mention of the *Odontorhynchus* and *Archæopteryx*, of the *Anomodontia*, the *Plesiosauria*, and other leading fossil forms which might be named, is a serious omission, but even this does not excuse the non-reference to so important a group as the living *Sphargidae*. Embryology and palæontology are branches of morphology coequal with the rest, and, so far as they reveal facts of primary significance, they should be dealt with as elementary subjects. Lack of appreciation of this principle is the weakest feature of the present work, which is, curiously enough, written with a special view to the requirements of the American student, who, of all beginners, is brought up in a palæontological air, and for whose benefit examples, wherever possible, are drawn from American as well as British animals.

Allowing for this serious defect, the book can be confidently recommended as well written and trustworthy, so far as it goes. It has been compiled at great pains, and its style leaves little to be desired. We wish it success and a speedy passage into a second edition; and, in anticipation of this, we would recommend to the authors' consideration the need of revision of such definitions as that of the endoderm cell (p. 48) as "tall"; of the blood-vessels (p. 89) as "chinks"; the replacement of the term "rudiment" on p. 259 by blastema; and certain other loosenesses which are self-evident. It is pertinent to this to remark that in some of their recent attempts at revised terminology, the zoologists of the Cambridge school have been none too successful. Thus, we note in the account of the life-history of the New Zealand reptile *Sphenodon*, given in the recently published natural history volume on "Amphibia and Reptiles," that the writer has substituted the word "æstivation" for what its discoverer rightly termed a hibernation. Is it possible that he has temporarily confused the southern summer with our own?

Of the illustrations, it may be said that figs. 266, 289 and 299 are examples which are poor, and might well be replaced; the statement that of the 32,000 "known species of Vertebrata" some 10,000 are Teleostei is surely excessive.

# MATHEMATICAL TEXT-BOOKS IN THE UNITED STATES.

*College Algebra.* By J. H. Boyd, Ph.D. Pp. xxii + 788. (Chicago: Scott, Foresman and Co., 1901.)

WE cannot obtain a complete view of the state of mathematical studies in a country merely by examining the text-books and treatises which are in vogue there; but we do, in this way, gain a good deal of information about the aims and standards of its mathematical teachers. Dr. Boyd's treatise illustrates very well the qualities and defects of American methods, and suggests a few general remarks, as well as particular criticisms, which may not be out of place.

First of all, it must be acknowledged that the excellences of the better class of mathematical authors in the United States greatly outweigh their deficiencies. The American student is alert and inquisitive; he is neither impervious to new ideas, nor unwilling to make experiments. Moreover, teachers and students alike regard mathematics in the proper spirit—as a science which has, indeed, a venerable history, but is at the same time living and progressive, with ever new developments and ever fresh applications to the needs of man. Many, if not most, of the leading mathematicians in the States have studied in Germany, and have thus become acquainted with the work of Kronecker and Weierstrass and the far-reaching influence of this upon function-theory and the foundations of analysis. In elementary geometry, too, they are not the slaves of tradition, as we are; and it is not impossible that they may ultimately give us the ideal class-book in geometry for which we are waiting.

Dr. Boyd, in his preface, accepts the modern standard of rigour, and in his choice of topics combines the indispensable rudiments with those developments and applications which are really important. The general scope of his book may be indicated by saying that Book I. deals with the fundamental laws of operation; II. with equations of the first degree; III. with indices, surds and complex quantities; IV. with quadratic equations; V. with proportion, progressions and logarithms; VI. with induction, permutations and combinations, and the binomial expansion for a positive integral exponent; VII. with limits and series; VIII. with the properties of determinants and the elementary theory of equations.

After proving the fundamental laws of operation for the cases where they are arithmetically intelligible, the author extends them by purely formal definitions; thus  $(a - b)$  is defined by the formal equivalence  $(a - b) + b = a$ . This is unobjectionable, but seems to us to require more justification than Dr. Boyd explicitly gives. He appeals to the "principle of permanence of form," but this "principle" remains practically an assumption. No doubt it would be extremely tedious to give (what we think has never been done) a complete logical proof that the application of the generalised laws of operation never involves an inconsistency; still, something more might have been done to help the reader to apprehend the reasonableness of the assumption.

Again, Dr. Boyd is not always consistent with himself. Thus, in the chapter on fractions, he begins with the formal definition  $\frac{a}{b} \times b = a$ ; he subsequently says that